EDUCATOR SUPPORT MATERIALS
Curriculum Structure

Why are learning about transportation issues important for today's youth?

Energy issues have become one of the most important issues of today's world and how we transport people and goods from place-to-place throughout the world is becoming increasingly significant as the global population continues to increase. Developing a basic understanding the history of transportation and how the combustion process works in an automobile provides the basis for deeper, critical thinking and understanding of how our personal transportation decisions affect not only our local community, but also the world community. Energy issues–and transportation issues in specific–touch upon all aspects of life and education including understanding social systems, political policies, economic policies, environmental impacts, and technological research. In this curriculum, our hope, through emphasizing the interconnectedness and interdependence of the modern world, is that students will develop an understanding of how everyday decisions affect more than their selves.

Curriculum Goals

The E.E.K! Project's focus is multi-fold. It aims to have students in middle school:

- develop and foster an interest in science;
- gain a working familiarity with transportation-related concepts including: history of transportation, combustion chemistry, emissions, global warming, and global environmental and social impacts;
- explore the benefits, costs, and impacts of different types of transportation;
- engage in real-world problem solving;
- explore the different roles transportation plays in achieving a high quality of life;
- develop an understanding of anticipatory and adaptive learning and how transportation-related issues and impacts provide current and contextual examples of these models throughout the world; and
- broaden an understanding of how personal decisions affect the world.

Curriculum Lesson-Modules

This curriculum is intended to provide 10 lesson-modules for 7th and 8th grade on transportation education. Each lesson-module provides detailed information for educators to lead thoughtful, informed discussions and hands'-on exercises. Within the 10 lesson-modules for each grade, the first five lessons are devoted to more nuts-and bolts learning about transportation: transportation history, gasoline production, combustion chemistry, new technologies, and global warming. The second five lessons build on this new learning and explore world transportation impacts in detail. Each grades' lessons contiguously builds on the previous grades lessons with expanded overlap to provide more sophisticated discussions and experiments as the grades progress.

7th Grade Overview

The 7th grade module has been created to encourage a deeper understanding surrounding transportation issues beginning with the history of transportation, understanding how the combustion process occurs, and how an engine works and how hybrid technology is being used in cars today. The final lessons are in-depth discussions of how the students' everyday actions and choices affect the world–combining concrete knowledge with deeper, critical thinking skills to discuss how our impact on the earth is contributing to global warming.

8th Grade Overview

The 8th grade curriculum builds directly on the 7th grade curriculum module and further investigates the global environmental and social impacts of automobile emissions throughout the world. The 8th grade curriculum culminates in studying alternative energy sources to gasoline, and completes with designing and building model cars that are powered by the sun via a solar panel.

Lesson Preparation and Time Allotments

While the curriculum is inherently flexible as to how much time is spent on each lesson-module, the curriculum should be taught in consecutive order given that each lesson directly builds on the previous one. The lesson-modules are large. Some larger than others, and we openly acknowledge that some of the lessons could take 3 –5 days each to adequately cover all the material. Therefore, we suggest in-service training to discuss timeline stipulations and questions concerning how the EEK! might enhance lessons you are already teaching within your curricular framework. The EEK! may also be used as a stand-alone curriculum module if so desired.

Basic Curriculum Structure

At the beginning of each grade, you will find a curriculum outline and standards-correlation for each lesson-module. At the beginning of each lesson-module, you will find a lesson overview, a lesson concept, and background material. Also, if additional background materials (charts, statistics, etc.) are necessary, these will be found at the end of each lesson-module.

Assessment

The modules have been created from an inquiry-based point of view and are intended to be taught in the Socratic teaching method. Nearly all lessons require either hands'-on experimentation or in-depth, open ended, "what-if" types of conversations between students facilitated by the teacher. Therefore, it is an antithetical approach to require pre- and post-tests of the students. We encourage educators to qualitatively evaluate the students' knowledge based on the increase in knowledge and awareness from the first conversations during Lesson 1 to the final projects completed in Lesson 10 of each grade.

At the end of each beginning of each lesson, there is an Assessment Strategy that we recommend. These are questions for the teachers to answer based strictly on the work created by the students. They also account and respect the need to provide letter grades and provide an assessment framework for each grade.

ASSESSMENT TOOLS

EEK! Daily Assessment

Student Name	Actively listened	Contributed positively to group discussion	Provided constructive, positive feedback to others	Asked informed questions	Stayed on task	Participated in lesson / completed lesson

Pre- and Post-Module Questions

1. Do you believe your actions affect others in the world?
2. Do you believe you have the ability to change the world?
3. Do you feel hopeful about the future of the world?

Question #1	Pre-Module Response	Post-Module Response
Do you believe your actions affect others in the world?		

Question #2	Pre-Module Response	Post-Module Response
Do you believe you have the ability to change the world?		

Question #3	Pre-Module Response	Post-Module Response
Do you feel hopeful about the future of the world?		

Assessment Question Sets

General Assessment Questions

The following questions can be used to assess the individual lessons within each grade module. On the first page of each lesson, there is an assessment section that indicates a variety of assessment strategies for the lesson.

1. Is there an increase in thoughtful discussion?
2. Is there an increase in conflicting discussion?
3. Are students able to express their viewpoints fluently?
4. Are students actively engaged in the discussion / activity / project?
5. Are students speaking honestly about their viewpoints with each other?
6. Are students thinking creatively?
7. Are students extrapolating the lesson information and leading discussions to other, related topics of interest or importance in their lives?
8. Are students making connections between the impact of their personal decisions and the rest of the world?
9. Do students see a "big picture" of how the information they are studying relates to larger system of information?
10. Are students working together respectfully?

Assessment Analysis Categories

The lessons are created to improve the students' quality of thinking, analyzing, and processing of information across all subject areas. Below are highlighted learning strategies that serve as end-goal assessment analysis.

VALUES (HABITS OF MIND)

- Skepticism
- Curiosity
- Openness
- New ideas
- Questioning of facts
- Consequences of actions
- Looking for connections between actions and impacts
- Understanding cause and effect

PROCESSING SKILLS

- Observe
- Classify
- Infer outcomes
- Hypothesize
- Analyze
- Collect data

ASSESSMENT END-GOALS

- Flow and exchange of ideas
- Environmental understanding
- Affect of actions (life cycle analysis)
- Varied perspectives
- Living within a global community

General Assessment Questions

QUESTION	YES	IMPROVING	NO
1. Is there an increase in thoughtful discussion?			
2. Is there an increase in conflicting discussion?			
3. Are students able to express their views fluently?			
4. Are students actively engaged in the discussion / activity / project?			
5. Are students speaking honestly about their viewpoints with each other?			
6. Are students thinking creatively?			
7. Are students extrapolating the lesson information and leading discussions to other, related topics of interest or importance in their lives?			
8. Are students making connections between the impact of their personal decisions and the rest of the world?			
9. Do students see a "big picture" of how the information are studying relates to larger system of information?			
10. Are students working together respectfully?			

VALUES (HABITS OF MIND)	YES	IMPROVING	NO
1. Is there an increase in *skepticism*?			
2. Is there an increase in *curiosity*?			
3. Is there an increase in *openness*?			
4. Is there an increase in *new ideas*?			
5. Is there an increase in *questioning of facts*?			
6. Is there an increase in *understanding the consequences of actions*?			
7. Is there an increase in *looking for connections between actions and impacts*?			
8. Is there an increase in *understanding cause and effect*?			

PROCESSING SKILLS	YES	IMPROVING	NO
1. Is there an increase in the ability to *observe*?			
2, Is there an increase in the ability to *classify* information?			
3. Is there an increase in the ability to *infer outcomes*?			
4. Is there an increase in the ability to *hypothesize*?			
5. Is there an increase in the ability to *analyze* information?			
6. Is there an increase in the ability to *collect data*?			

Assessment Analysis Categories continued

ASSESSMENT END-GOALS	YES	IMPROVING	NO
1. Is there an increase in the *flow and exchange of ideas* within the class?			
2, Is there an increase in the students' understanding of *environmental issues*?			
3. Is there an increase in the students' understanding of of *the affects of their personal actions and decision-making throughout the world community*?			
4. Is there an increase in the students' ability to accept *different perspectives other than their own on various topics of discussion*?			
5. Is there an increase in the students' ability to understand that they *are living with a global community*?			

SUSTAINABLE FUTURES GROUP

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Our future and the planet's rest on learning to question all our everyday actions and their impacts–openly and in public.

Sustainability and Energy Education

Formed in 1990, our mission is to facilitate social learning for sustainability. Through the building of a culture of sustainability via broad-scale outreach by collaborating with educators, schools, students, and businesses, we view this transition toward sustainability as necessitating the building of a more equitable and ecoculturally diverse world for all beings–present and future.

Guiding Principles

The guiding principle of the Sustainable Futures Group is to employ a bottom-up, collaborative strategy based upon systems thinking and organizational learning principles. This requires active engagement with all stakeholders and a willingness to think out-of-the-box for both our clients and ourselves. Our goal is to leave our clients with the tools, resources, and collaborative decision-making and learning skills to complete the process of successfully implementing their collective vision on their own.

We find top-down, "expert-based" consulting to be antithetical to our mission. We see all of our consulting as a collaborative process. We see ourselves as helping to guide this collaborative process by helping organizations clarify their shared vision and providing new and innovative tools, techniques, strategies, and insights that help empower our clients to successfully implement this shared vision.

We demand of ourselves the same level of transparency, open dialogue, and critical reflection that we hope to illicit from our clients. Furthermore, we employ a dynamic, adaptive approach to problem-solving and critical analysis that we hope will be modeled throughout our clients' work and personal lives.

Educational Model

Our educational work focuses and includes the following topics of concern: alternative energy, renewable resources, environmental impacts, agricultural practices, food and nutrition, resource use, and arts integration within educational models and curriculum. Our current emphasis is on creating "cradle to cradle" models for teacher education based on systems-thinking approaches to teaching and learning.

This model has six key elements: integrating reason and emotion into teaching and learning; presenting and discussing unsustainable life choices and facilitating open forums within the classroom to discuss values; illuminating the conflicts and trade-offs between visions of a sustainable and desirable future and our everyday choices and the real (and potential) outcomes of these everyday actions; presenting a broad array of resources to support teachers in taking action (especially through developing community indicators); and creating a broad based, community-wide learning loop that will continually engage all parties in both the practical issues in education for sustainability and the meta issues, such as learning “how to decide how to decide”.

Our hope is to build a culture of sustainability, one step at a time, by creating both an intergenerational network and a community-learning model that will spread widely.

Educational Expertise

In order to help integrate sustainability across an institution’s policy, operations, and mission we specialize in leading the following seminars and projects:

- Leading social learning and systems thinking seminars;
- Conducting sustainability assessment;
- Directing greenhouse gas emissions inventories;
- Teaching energy auditing (and teaching institutions how to self-audit;)
- Analyzing existing K-12 and higher education curriculum for sustainability topics;
- Incorporating standards alignment for K-12 curriculum (to reflect sustainability issues);
- Integrating sustainability topics / issues into existing curriculum;
- Developing new interdisciplinary sustainability curriculum;
- Leading EEK! for Sustainable Development in-service trainings.

The EEK! Project for Sustainable Decision-making

The Energy Education Kit (EEK!) Project for Sustainable Decision-makling is an innovative, hands-on, science-based, interdisciplinary curriculum that pairs portable, learning laboratory energy education kits with standards-aligned curriculum and exercises. The kits include tools and equipment to perform a variety of student-directed experiments in the classroom and curriculum that is easily assimilated into the already full calendar of the K - 6 teacher. This project provides K- 12 teachers with a self-contained science module on energy education that can be taught “as is” or used as a platform for creating expanded social science- and history-based energy education curriculum.

The EEK! Project's focus is multi-fold. It aims to have students beginning in Kindergarten:

- develop and foster an interest in science;
- gain a working familiarity with energy-related concepts including: different forms of energy, energy conversion, energy measurement, energy efficiency, and power;
- explore the benefits, costs, and impacts of energy use;
- engage in real-world problem solving;
- explore the different roles energy plays in achieving a high quality of life; and
- develop an appreciation for how energy is used throughout the world and how it might be used in the future.

The EEK! Project is framed as a 10-day curricular module. The curriculum builds on itself successively from K onward. Two teaching timelines are suggested: a two-week module or a 10-week module.

Curriculum Overview

The K-6th grade curriculum focuses on the following topics:

- Social awareness of world energy use;
- Resource use and transportation of resources;
- Energy conversion;
- Renewable and non-renewable forms of energy; and
- Building analysis and energy use.

The 7th/8th grade curriculum focuses on transportation issues including:

- Transportation history;
- World fuel production;
- Automobile design;
- Automobile life cycle analysis;
- Consumer choice and decision-making; and,
- Potential future energy scenarios.

The high school curriculum (9th – 12th) focuses on building life-cycle analysis, building weatherization, and building auditing and includes:

- Energy use life-cycle analysis;
- Building design;
- Energy efficient design principles;
- Building weatherization issues;
- Lighting issues;
- How to conduct full-scale building audits; and,
- How to effectively implement changes to create more energy efficient buildings.

Partners

Harold Glasser is an associate professor, (Ph.D., University of California, Davis) in the Environmental Studies Program and the Environmental Institute at Western Michigan University. His research focuses on the evaluation of complex environmental problems and the process of making individual and social choices about using and protecting the environment. He is a Senior Fellow at the University Leaders for a Sustainable Future (D.C), Chair of the EPA Colleges and Universities Sector Assessment Working Group, Director of the Campus Sustainability Assessment Project (www.csap.envs.wmich.edu), Chair of Western Michigan University's Sustainability Committee, founding member of the WMU Campus Sustainable Design Committee, a member of the Economicology Group, and works with the Foundation for Deep Ecology as general editor of the 10 Volume *Selected Works of Arne Naess* (Kluwer Academic Press, 2005).

D Jones focuses on K-12 and teacher education. Ms. Jones was a master teacher in the California Public School System. She draws on more than 13 years of creative curriculum development and classroom teaching. Much of her work has focused on creating student directed curriculum that satisfies State Standards and benchmarks. She has worked on three Education Grants for the State of Michigan in the past four years. Prior to moving to Michigan, she served on California State Standards committee developing more learning-reflective Standards and Teaching Rubrics for English, Math, and Science.

For information concerning the EEK! curriculum, teacher training workshops, and systems thinking approaches to teaching and learning seminars, please contact us at:

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